PUBN-DATE: May 20, 1998

INT-CL (IPC): C12 N 15/29; C07 K 14/415; C12 P 21/02; C12 N 1/21; C07 K 16/16; C12 N 5/04; A23 L 3/375; A23 G 9/02; A23 G 9/04; C12 N 15/82
EUR-CL (EPC): A23G009/02; A23G009/02, C07K014/415 , C12N015/82

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Drawi Desc | Image

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☐ 16. Document ID: US 6348569 B1

L2: Entry 16 of 16 File: DWPI Feb 19, 2002

DERWENT-ACC-NO: 2002-380753
DERWENT-WEEK: 200241
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TITLE: New class of thermal hysteresis, antifreeze proteins isolated and purified from Choristoneura species for decreasing the freezing point of aqueous solution and to protect plants from climatic freezing conditions

INVENTOR: DAVIES, P L; RAHAVARD, M ; TYSHENKO, M G ; WALKER, V K

PRIORITY-DATA: 1997US-0868594 (June 3, 1997), 1996US-0657264 (June 3, 1996), 1999US-0434323 (November 4, 1999)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 6348569 B1	February 19, 2002		027	C07K014/00

INT-CL (IPC): C07 K 14/00

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Drawi Desc | Image

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CARROTS.DWPI,TDBD,EPAB,USPT,PGPB.	4151
(1 AND CARROT).USPT,PGPB,EPAB,DWPI,TDBD.	16
(L1 AND CARROT).USPT,PGPB,EPAB,DWPI,TDBD.	16

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INDEX 'ADISCTI, ADISINSIGHT, ADISNEWS, AGRICOLA, ANABSTR, AQUASCI, BIOBUSINESS,
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       CAPLUS, CEABA-VTB, CEN, CIN, CONFSCI, CROPB, CROPU, DDFB, DDFU, DGENE,
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=> s (antifreeze (w) (peptide? or polypeptide? or protein?)) and carrot?
          1   FILE AGRICOLA
          1   FILE BIOCOMMERCE
          6   FILE BIOSIS
          1   FILE BIOTECHABS
          1   FILE BIOTECHDS
          3   FILE BIOTECHNO
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         10   FILE CAPLUS
          2   FILE CEABA-VTB
          1   FILE CIN
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          4   FILE MEDLINE
          1   FILE PASCAL
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         14   FILE USPATFULL
          1   FILE WPIDS
  63 FILES SEARCHED...
          1   FILE WPINDEX

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L1   QUE (ANTIFREEZE (W) (PEPTIDE? OR POLYPEPTIDE? OR PROTEIN?)) AND CARROT?

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L15 2 FILE FSTA
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L18 1 FILE BIOCOMMERCE
L19 1 FILE BIOTECHDS
L20 1 FILE CIN
L21 1 FILE IFIPAT
L22 1 FILE LIFESCI
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L27 ANSWER 1 OF 57 USPATFULL DUPLICATE 1
IN Walker, Virginia K., Sydenham, CANADA
Davies, Peter L., Kingston, CANADA
Rahavard, Mitra, Kingston, CANADA
Tyshenko, Michael G., Kingston, CANADA
TI Spruce budworm **antifreeze proteins**, genes and method
of using same
AB A novel class of thermal hysteresis, **antifreeze**
proteins (THPs) has been isolated and purified from
Choristoneura sp., including the eastern spruce budworm C. fumiferana.

The invention provides for nucleic acids which encode these **antifreeze proteins**. The invention also provides for antibodies reactive to these novel **antifreeze proteins** . The invention also includes a method for decreasing the freezing point of an aqueous solution by adding these novel **antifreeze proteins** to the solution.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 2 OF 57 USPATFULL
IN Graham, Laurie A., Kingston, CANADA
Liou, Yih-Cherng, Kingston, CANADA
Walker, Virginia K., Sydenham, CANADA
Davies, Peter L., Kingston, CANADA
TI Tenebrio **antifreeze proteins**
AB A novel class of thermal hysteresis (**antifreeze**) **proteins** (THP) that have up to 100 times the specific activity of fish **antifreeze proteins** has been isolated and purified from the mealworm beetle, Tenebrio molitor. Internal sequencing of the proteins, leading to cDNA cloning and production of the protein in bacteria has confirmed the identity and activity of the 8.4 to 10.7 kDa THP. They are novel Thr- and Cys-rich proteins composed largely of 12-amino-acid repeats of cys-thr-xaa-ser-xaa-xaa-cys-xaa-xaa-ala-xaa-thr. At a concentration of 55 .mu.g/mL, the THP depressed the freezing point 1.6.degree. C. below the melting point, and at a concentration of .about.1 mg/mL the THP or its variants can account for the 5.5.degree. C. of thermal hysteresis found in Tenebrio larvae. The THP function by an adsorption-inhibition mechanism and produce oval-shaped ice crystals with curved prism faces.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 3 OF 57 USPATFULL
IN Daniel, Adrian, Bedford, UNITED KINGDOM
Fenn, Richard Anthony, Gloucestershire, UNITED KINGDOM
Oldroyd, Jon Richard, Bedford, UNITED KINGDOM
TI Ice confection
AB An unaerated ice confection in the form of thin, unsupported, discrete pieces which are stable during packaging, storage and distribution wherein the ice confection comprises an **antifreeze protein** and has the following mechanical properties;

.DELTA. modulus/original modulus.gtoreq.0.4, and/or

.DELTA. strength/original strength.gtoreq.0.4;

providing that when .DELTA. modulus/original modulus.ltoreq.6.0,

.DELTA. modulus.gtoreq.50 MPa, and/or when

.DELTA. strength/original strength.ltoreq.2.0,

.DELTA. strength.gtoreq.0.2 MPa.

L27 ANSWER 4 OF 57 USPATFULL
IN Daniel, Adrian, Bedford, UNITED KINGDOM
Oldroyd, Jon Richard, Bedford, UNITED KINGDOM
TI Ice confection
AB An ice confection product having a volume of from 1 to 20 ml and a thickness of greater than 5 mm comprising an **antifreeze protein**, wherein .DELTA. modulus/original modulus.gtoreq.0.4, and/or .DELTA. strength/original strength.gtoreq.0.4; providing that when .DELTA. modulus/original modulus.ltoreq.6.0, .DELTA. modulus.gtoreq.50 MPa, and/or when .DELTA. strength/original

strength.ltoreq.2.0, .DELTA. strength.gtoreq.0.2 MPa. Such ice confection products have properties which are akin to boiled sweets. Such products cannot be bitten or chewed but must be sucked, resulting in a product which remains in the mouth longer and is more refreshing.

L27 ANSWER 5 OF 57 USPATFULL
IN Daniel, Adrian, Bedford, UNITED KINGDOM
Lacy, Ian, Bedford, UNITED KINGDOM
Oldroyd, Jon Richard, Bedford, UNITED KINGDOM
TI Ice confection
AB A water ice comprising an **antifreeze protein**, a stabilizer and not less than 0.1 wt % of a protein based aerating agent obtainable by a process comprising aerating the ice confection with an aerating gas which contains at least 50% by volume of a water soluble gas such as carbon dioxide, nitrous oxide and mixtures thereof.

L27 ANSWER 6 OF 57 USPATFULL
IN Graham, Laurie A., Kingston, CANADA
Liou, Yih-Cherng, Kingston, CANADA
Walker, Virginia K., Sydenham, CANADA
Davies, Peter L., Kingston, CANADA
TI Tenebrio **antifreeze proteins**
AB A novel class of thermal hysteresis (**antifreeze**) **proteins** (THP) that have up to 100 times the specific activity of fish **antifreeze proteins** has been isolated and purified from the mealworm beetle, Tenebrio molitor. Internal sequencing of the proteins, leading to cDNA cloning and production of the protein in bacteria has confirmed the identity and activity of the 8.4 to 10.7 kDa THP. They are novel Thr- and Cys-rich proteins composed largely of 12-amino-acid repeats of cys-thr-xaa-ser-xaa-xaa-cys-xaa-xaa-ala-xaa-thr. At a concentration of 55 .mu.g/mL, the THP depressed the freezing point 1.6.degree. C. below the melting point, and at a concentration of .about.1 mg/mL the THP or its variants can account for the 5.5.degree. C. of thermal hysteresis found in Tenebrio larvae. The THP function by an adsorption-inhibition mechanism and produce oval-shaped ice crystals with curved prism faces.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 7 OF 57 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 2
SO Cryobiology (2002), 44(3), 307-310
CODEN: CRYBAS; ISSN: 0011-2240
AU Wang, Li Hong; Wusteman, Monica C.; Smallwood, Maggie; Pegg, David E.
TI The stability during low-temperature storage of an **antifreeze protein** isolated from the roots of cold-acclimated **carrots**
AB Natural **antifreeze proteins** (AFPs) not only inhibit freezing at high subzero temps.; they have the addnl. properties of inhibiting the recrystn. of ice during warming and of preventing devitrification. The natural AFP that occurs in the roots of cold-acclimated **carrots** can be extd. reasonably simply and is non-toxic: it was selected for study as a possible ingredient of the vitrification mixts. that are being developed for use in tissue cryopreservation. For this application, it would be essential for the AFP to remain active during prolonged storage at very low temps. For logistic reasons, it would also be essential to have an effective method of storage of the purified AFP itself. In this study, **carrot** AFP was isolated and purified, and its ability to inhibit recrystn. was monitored over 40 wk of storage at -80 or -196 .degree.C. The data revealed a progressive decrease in activity during storage, reaching half the original activity in 10-20 wk and only 2-3% of the original activity at 40 wk. These data suggest that **carrot** AFP will not be effective in tissue cryopreservation.

L27 ANSWER 8 OF 57 CAPLUS COPYRIGHT 2002 ACS
SO Plant Cell Reports (2002), 21(4), 296-301
CODEN: PCRPD8; ISSN: 0721-7714
AU Fan, Y.; Liu, B.; Wang, H.; Wang, S.; Wang, J.
TI Cloning of an **antifreeze protein** gene from **carrot** and its influence on cold tolerance in transgenic tobacco plants
AB The gene encoding a 1,099-bp **carrot antifreeze protein** (AFP) was amplified by the polymerase chain reaction (PCR) using genomic DNA from **carrot** seedlings as the template. Sequencing results indicated a difference of three bases between this cloned gene and that published in GenBank. The cloned **antifreeze protein** gene was expressed in Escherichia coli, and a fusion protein of about 60 kDa was detected after iso-Pr thiogalactoside induction. This AFP gene was also cloned into binary vector pCAMBIA2300 with the CaMV 35S promoter and used to transform tobacco NC82. PCR and Southern blot results verified integration of this gene into the genome of tobacco and reverse transcription-PCR verified that this gene had been expressed in transgenic tobacco. Expts. confirmed that transgenic tobacco plants displayed greater stamina than wild-type ones when subjected to cold treatment. The genetic stability of the transgenic lines was analyzed, and findings confirmed that transgenic expression of the **carrot** AFP gene could enhance the tolerance of plants to cold or frigid conditions.

L27 ANSWER 9 OF 57 CAPLUS COPYRIGHT 2002 ACS
SO Zhongshan Daxue Xuebao, Ziran Kexueban (2002), 41(3), 52-55
CODEN: CHTHAJ; ISSN: 0529-6579
AU Fan, Yun; Liu, Bing; Wang, Hong-bin; Wang, Shu-qi; Wang, Jin-fa
TI Cloning and expression of an **antifreeze protein** gene in **carrot**
AB Compn. of total proteins in cold-induced **carrot** seedlings was compared with that in non-induced **carrot** seedlings by SDS PAGE. A different protein band, about 36 000 appeared. This result indicated that **antifreeze proteins** (AFPs) were expressed in cold-induced **carrot** seedlings. Based on what was reported by Dawn Worrall and Knut Meyer, the gene encoding this **antifreeze protein** which is 1 099 bp long, was amplified by PCR using genomic DNA of **carrot** seedlings as template. Sequencing results show that there is only a difference of three bases between this cloned gene and that published on GenBank. This **antifreeze protein** gene (AFP gene) was cloned in the expression vector (pGEX4T1) of E. coli. A fusion protein, about 60 000, could be detected after IPTG-induction.

L27 ANSWER 10 OF 57 USPATFULL DUPLICATE 3
IN Darling, Donald Frank, Colworth, United Kingdom
Hoddle, Andrew, Colworth, United Kingdom
TI Frozen food product
AB A process for the production of a frozen food product comprising anti-freeze peptide (AFP), wherein the product is at least partially pre-frozen in the substantial absence of free AFP, followed by including the free AFP therein.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 11 OF 57 USPATFULL
IN ANTHONY FENN, RICHARD, COLWORTH, Great Britain
NEEDHAM, DAVID, COLWORTH, Great Britain
SMALLWOOD, KEITH, COLWORTH, Great Britain
TI FROZEN FOOD PRODUCT
AB A process for the production of a frozen food product comprising AFP, wherein the conditions are chosen such that the ice-crystals in the product have an aspect ratio of from 1.9 to 3.

L27 ANSWER 12 OF 57 CAPLUS COPYRIGHT 2002 ACS
SO Jpn. Kokai Tokkyo Koho, 6 pp.
CODEN: JKXXAF
IN Kohata, Hitoshi; Kawahara, Hidehisa; Komura, Keigo; Kaneko, Shoji; Sakamoto, Noriko
TI Glucanase-like **antifreeze protein** from cold resistant vegetables
AB **Antifreeze protein** from Cruciferae (Brassicaceae), Apiaceae (Umbelliferae), Liliaceae, or Compositae (Asteraceae) vegetables, and method for its prodn. by salicylic acid, abscisic acid, or cold treatment, is disclosed. Chinese cabbage (Brassica pekinensis), Raphanus sativus, broccoli, Brassica rapa, Brassica chinensis komatsuna, turnip, garland chrysanthemum (Chrysanthemum coronarium), **carrot**, green onion (Allium fistulosum). From partial amino acid sequencing and Western blot, the **antifreeze protein** was suggested to be glucanase, or chitinase.

L27 ANSWER 13 OF 57 SCISEARCH COPYRIGHT 2002 ISI (R)
SO BIOPHYSICAL JOURNAL, (MAR 2001) Vol. 80, No. 3, pp. 1169-1173.
Publisher: BIOPHYSICAL SOCIETY, 9650 ROCKVILLE PIKE, BETHESDA, MD 20814-3998 USA.
ISSN: 0006-3495.
AU Graether S P; Jia Z C (Reprint)
TI Modeling Pseudomonas syringae ice-nucleation protein as a beta-helical protein
AB **Antifreeze proteins** (AFPs) inhibit the growth of ice, whereas ice-nucleation proteins (INPs) promote its formation. Although the structures of several AFPs are known, the structure of INP has been modeled thus far because of the difficulty in determining membrane protein structures. Here, we present a novel model of an INP structure from Pseudomonas syringae based on comparison with two newly determined insect AFP structures. The results suggest that both this class of AFPs and INPs may have a similar P-helical fold and that they could interact with water through the repetitive TXT motif. By theoretical arguments, we show that the distinguishing feature between an ice inhibitor and an ice nucleator lies in the size of the ice-interacting surface. For INPs, the larger surface area acts as a template that is larger than the critical ice embryo surface area required for growth. In contrast, AFPs are small enough so that they bind to ice and inhibit further growth without acting as a nucleator.

L27 ANSWER 14 OF 57 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 4
SO Xibei Zhiwu Xuebao (2001), 21(2), 226-231
CODEN: XZXUEV; ISSN: 1000-4025
AU Yin, Mingan; Cui, Hongwen; Fan, Daiming; Guo, Li
TI Cloning and sequencing of **antifreeze protein** gene in Daucus carota var sativus Hoffm Deutschl
AB The **antifreeze protein** gene (afp) in three native **carrot** cultivars (Daucus carota var sativus Hoffm Deutschl), Wuzhong **carrot** in Ningxia, Huaxian **carrot** in Shanxi and Hanzhong **carrot** in Shanxi, was cloned by PCR (polymerase chain reaction). Wuzhong **carrot**'s afp was sequenced and its sequence was compared with that of Daucus carota var autumn King from British. There were 35 different bases between two varieties in 1004 sequenced nucleotides, among which there was 20 nonsense mutations and 15 sense mutations. Based on sense mutations homol. was 98.5%.

L27 ANSWER 15 OF 57 SCISEARCH COPYRIGHT 2002 ISI (R)
SO CRYO-LETTERS, (MAY-JUN 2001) Vol. 22, No. 3, pp. 175-182.
Publisher: CRYO LETTERS, C/O ROYAL VETERINARY COLLEGE, ROYAL COLLEGE ST, LONDON NW1 0TU, ENGLAND.
ISSN: 0143-2044.
AU Wang J H (Reprint); Bian H W; Zhang Y X; Cheng H P
TI The dual effect of **antifreeze protein** on cryopreservation of rice (Oryza sativa L.) embryogenic suspension cells

AB The effects of fish **antifreeze protein** AFP-I on cryopreservation of rice suspension cells by three different protocols were investigated. During the two-step method, AFP-I at 0.01 mg/ml significantly lowered the viability of both precultured and non-precultured cells. During the vitrification method, AFP-I at 0.2 mg/ml improved the. viability of suboptimally thawed cells; however, much higher doses of this protein (10mg/ml) attenuated the cell viability. During rapid freezing of rice cells in the solutions with relatively high (but non-vitrifying) concentrations of cryoprotectant, AFP-I displayed protective action in the higher concentrated cryoprotectants and detrimental effect in more dilute ones. Taken together, it was concluded that, depending upon a number of factors discussed in the present paper, both positive effect and negative effect could be observed during application of AFP to cryopreservation of rice cells. The possible mechanism of this dual character was discussed.

L27 ANSWER 16 OF 57 CABA COPYRIGHT 2002 CABI
SO Acta Horticulturae Sinica, (2001) Vol. 28, No. 2, pp. 173-174. 3 ref.
Publisher: Chinese Society for Horticultural Science. ISSN: 0513-353X
AU Yin Ming'an; Cui HongWen; Fan DaiMing; Guo Li; Yin, M.; Cui, H. W.; Fan, D. M.; Guo, L.
TI Cloning and sequencing of **antifreeze protein** gene in Daucus carota var. sativus Hoffm Deutschl.
AB The **antifreeze protein** gene (afp) in Chinese **carrot** (D. carota var. sativus) cultivars Wuzhong Ningxia, Huaxian Shaanxi and Hanzhong Shaanxi were cloned and sequenced by polymerase chain reaction and compared with that of the British **carrot** (D. carota). There were 36 bases in 1004 nucleotides (3.6%) between the Chinese and British **carrots**. Among the different bases, there were 21 nonsense and 15 sense mutations. Based on the 15 sense mutations, homology was 98.5%.

L27 ANSWER 17 OF 57 SCISEARCH COPYRIGHT 2002 ISI (R)
SO GENE, (5 SEP 2001) Vol. 275, No. 1, pp. 115-124.
Publisher: ELSEVIER SCIENCE BV, PO BOX 211, 1000 AE AMSTERDAM, NETHERLANDS.
ISSN: 0378-1119.
AU Holmberg N; Farres J; Bailey J E; Kallio P T (Reprint)
TI Targeted expression of a synthetic codon optimized gene, encoding the spruce budworm **antifreeze protein**, leads to accumulation of antifreeze activity in the apoplasts of transgenic tobacco
AB A synthetic gene based on the primary sequence of the mature spruce budworm **antifreeze protein** (sbwAFP) was constructed by primer overlap extension. The amino acid codons were chosen to mimic those of a highly expressed tobacco nuclear gene. A DNA sequence encoding the amino-terminal leader sequence from the tobacco pathogen related protein 1b (PR), which targets the protein to the apoplastic space, was fused in frame to the synthetic sbwAFP gene. This fusion was placed downstream of the cauliflower mosaic virus 35S promoter and upstream of the nopaline synthase terminator in a T-DNA binary vector. Transgenic tobacco lines transcribing PR-sbvtAFP were selected by RT-PCR. The apoplastic protein fractions of sbwAFP expressing tobacco lines exhibited enhanced antifreeze activity as demonstrated by the ability to inhibit ice re-crystallization and increased thermal hysteresis.

L27 ANSWER 18 OF 57 USPATFULL DUPLICATE 5
IN Lillford, Peter John, Colworth, United Kingdom
McArthur, Andrew John, Colworth, United Kingdom
Sidebottom, Christopher Michael, Colworth, United Kingdom
Wilding, Peter, Colworth, United Kingdom
TI Frozen food product
AB A process for the recovery of AFPs from natural sources, said process involving the steps of

a) isolating an AFP containing juice from the natural source;

b) heat treating the natural source or the AFP containing juice to a temperature of at least 60.degree. C.;

c) removing the insoluble fraction.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 19 OF 57 USPATFULL DUPLICATE 6
IN Byass, Louise Jane, Heslington, United Kingdom
Darling, Donald Frank, Colworth, United Kingdom
Doucet, Charlotte Juliette, Heslington, United Kingdom
Fenn, Richard Anthony, Colworth, United Kingdom
Lillford, Peter John, Colworth, United Kingdom
McArthur, Andrew John, Colworth, United Kingdom
Needham, David, Colworth, United Kingdom
Sidebottom, Christopher, Colworth, United Kingdom
Smallwood, Keith, Colworth, United Kingdom
Smallwood, Margaret Felicia, Heslington, United Kingdom
TI Frozen food product
AB Plant anti freeze proteins can advantageously be incorporated into frozen confectionery products, provided they have the capability of limiting the growth of ice crystals

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 20 OF 57 USPATFULL DUPLICATE 7
IN Lillford, Peter John, Colworth, United Kingdom
McArthur, Andrew John, Colworth, United Kingdom
Sidebottom, Christopher Michael, Colworth, United Kingdom
TI Frozen food product
AB A process for the recovery of AFPs from natural sources, said process involving the steps of

a) isolating an AFP containing juice from the natural source;

b) heat treating the natural source or the AFP containing juice to a temperature of at least 60.degree. C.;

c) removing the insoluble fraction.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 21 OF 57 USPATFULL
IN Lillford, Peter John, Colworth, United Kingdom
McArthur, Andrew John, Colworth, United Kingdom
Sidebottom, Christopher Michael, Colworth, United Kingdom
Wilding, Peter, Colworth, United Kingdom
TI Frozen food product
AB A process for the recovery of AFPs from natural sources, said process involving the steps of

a) isolating an AFP containing juice from the natural source;

b) heat treating the natural source or the AFP containing juice to a temperature of at least 60.degree. C.;

c) removing the insoluble fraction.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 22 OF 57 USPATFULL
IN Walker, Virginia K., Sydenham, Canada
Davies, Peter L., Kingston, Canada

Rahavard, Mitra, Kingston, Canada
Tyshenko, Michael G., Kingston, Canada
TI Spruce budworm **antifreeze proteins**, genes and methods of using same
AB A novel class of thermal hysteresis, **antifreeze proteins** (THPs) has been isolated and purified from Choristoneura sp., including the eastern spruce budworm C. fumiferana. The invention provides for nucleic acids which encode these **antifreeze proteins**. The invention also provides for antibodies reactive to these novel **antifreeze proteins** . The invention also includes a method for decreasing the freezing point of an aqueous solution by adding these novel **antifreeze proteins** to the solution.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 23 OF 57 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 8
SO Biochemical Journal (1999), 340(2), 385-391
CODEN: BIJOAK; ISSN: 0264-6021
AU Smallwood, Maggie; Worrall, Dawn; Byass, Louise; Elias, Luisa; Ashford, David; Doucet, Charlotte J.; Holt, Chris; Telford, Julia; Lillford, Peter; Bowles, Dianna J.
TI Isolation and characterization of a novel **antifreeze protein** from **carrot** (Daucus carota)
AB A modified assay for inhibition of ice recrystn. which allows unequivocal identification of activity in plant exts. is described. Using this assay a novel, cold-induced, 36 kDa **antifreeze protein** has been isolated from the tap root of cold-acclimated **carrot** (Daucus carota) plants. This protein inhibits the recrystn. of ice and exhibits thermal-hysteresis activity. The polypeptide behaves as monomer in soln. and is N-glycosylated. The corresponding gene is unique in the **carrot** genome and induced by cold. The **antifreeze protein** appears to be localized within the apoplast.

L27 ANSWER 24 OF 57 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 9
SO FEBS Letters (1999), 447(2,3), 171-178
CODEN: FEBLAL; ISSN: 0014-5793
AU Meyer, Knut; Keil, Michael; Naldrett, Michael J.
TI A leucine-rich repeat protein of **carrot** that exhibits antifreeze activity
AB A gene encoding an **antifreeze protein** (AFP) was isolated from **carrot** (Daucus carota) using sequence information derived from the purified protein. The **carrot** AFP is highly similar to the polygalacturonase inhibitor protein (PGIP) family of apoplastic plant leucine-rich repeat (LRR) proteins. Expression of the AFP gene is rapidly induced by low temps. Furthermore, expression of the AFP gene in transgenic Arabidopsis thaliana plants leads to an accumulation of antifreeze activity. Our findings suggest that a new type of plant **antifreeze protein** has recently evolved from PGIPs.

L27 ANSWER 25 OF 57 FSTA COPYRIGHT 2002 IFIS
SO Biochemical Journal, (1999), 340 (2) 385-391, 29 ref.
ISSN: 0264-6021
AU Smallwood, M.; Worrall, D.; Byass, L.; Elias, L.; Ashford, D.; Doucet, C. J.; Holt, C.; Telford, J.; Lillford, P.; Bowles, D. J.
TI Isolation and characterization of a novel **antifreeze protein** from **carrot** (Daucus carota).
AN 2000(04):J0815 FSTA
AB A modified assay for inhibition of ice recrystallization which allows unequivocal identification of activity in plant extracts is described. Using this assay, a novel, cold-induced, 36 kDa **antifreeze protein** was isolated from the tap root of cold-acclimated **carrot** (Daucus carota cv. Autumn King) plants. This protein inhibits the recrystallization of ice and exhibits thermal-hysteresis

activity. The polypeptide behaves as monomer in solution and is N-glycosylated. The corresponding gene is unique in the **carrot** genome and induced by cold. The **antifreeze protein** appears to be localized within the apoplast.

L27 ANSWER 26 OF 57 CEABA-VTB COPYRIGHT 2002 DECHEMA
SO PCT Patent Appl. (1998) WO 9822591(Appl. EP 96308362/1 Filed 19 Nov 1996)
CODEN: PIXXD2
AU Byass, L. J.; Doucet, C. J.; Fenn, R. A.; McArthur, A. J.; Sidebottom, C. M.; et al. (Unilever plc, London, EC4P 4BQ, UK)
TI **Carrot antifreeze polypeptides**
AN 1998(06):6083 CEABA-VTB FS B
AB Novel **antifreeze polypeptides** are disclosed that can be isolated from **carrots**. These peptides can favourably influence the properties of consumer products, e.g. frozen confectionary products.

L27 ANSWER 27 OF 57 CEABA-VTB COPYRIGHT 2002 DECHEMA
SO European Patent Appl. (1998) EP 843010(Appl. EP 96308362/1 Filed 19 Nov 1996)
CODEN: EPXXDW
TI **Carrot antifreeze polypeptides**
AN 1998(07):0861 CEABA-VTB FS B
AB Disclosed are novel **antifreeze polypeptides** can be isolated from **carrots**. These peptides can favourable influence the properties of consumer products, e.g. frozen confectionery products.

L27 ANSWER 28 OF 57 PHIN COPYRIGHT 2002 PJB

SO ASI (1998) No. 2843 p4
TI First plant **antifreeze protein** isolated

L27 ANSWER 29 OF 57 CAPLUS COPYRIGHT 2002 ACS
SO Eur. Pat. Appl., 13 pp.
CODEN: EPXXDW
TI **Carrot** anti-freeze polypeptides
AB Novel **antifreeze polypeptides** can be isolated from **carrots**. These peptides can favorable influence the properties of consumer products e.g. frozen confectionery products. Claims include genes for the **antifreeze protein** and antibodies to the **antifreeze protein**. For example, one peptide fragment claimed has the sequence LEU-PRO-ASN-LEU-PHE-GLY-LYS.

L27 ANSWER 30 OF 57 FSTA COPYRIGHT 2002 IFIS
SO European Patent Application, (1998)
TI **Carrot** anti-freeze polypeptides.
AN 1999(02):T0065 FSTA
AB Polypeptides with antifreeze properties, isolated from **carrots**, can be used in such foods as frozen confectionery products. [From En summ.]

L27 ANSWER 31 OF 57 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 10
SO Science (Washington, D. C.) (1998), 282(5386), 115-117
CODEN: SCIEAS; ISSN: 0036-8075
AU Worrall, Dawn; Elias, Luisa; Ashford, David; Smallwood, Maggie; Sidebottom, Chris; Lillford, Peter; Telford, Julia; Holt, Chris; Bowles, Dianna
TI A **carrot** leucine-rich-repeat protein that inhibits ice recrystallization
AB Many organisms adapted to live at subzero temps. express **antifreeze proteins** that improve their tolerance to freezing. Although structurally diverse, all **antifreeze proteins** interact with ice surfaces, depress the freezing temp. of aq. solns., and inhibit ice crystal growth. A protein purified from **carrot** shares these functional features with **antifreeze**

proteins of fish. Expression of the **carrot** cDNA in tobacco resulted in the accumulation of the **carrot** cDNA in tobacco resulted in the accumulation of antifreeze activity in the apoplast of plants grown at greenhouse temps. The sequence of **carrot antifreeze protein** is similar to that of polygalacturonase inhibitor proteins and contains leucine-rich repeats.

L27 ANSWER 32 OF 57 CIN COPYRIGHT 2002 ACS
SO Biotech News, Oct 1998 (19981000), 17(10), p. 1, 3. ISSN: 0263-8029; CODEN: BTNEEN.
TI York Researchers Identify '**Antifreeze**' **Protein** in **Carrots**
AB A team of plant biologists at the University of York has isolated the first plant **antifreeze protein**. The naturally occurring 'antifreeze' in **carrots** might lead to improved frozen foods, more efficient freezing of tissue for medical use and better frost tolerance for crops. The discovery of the **antifreeze protein** by a team from the Plant Stress Response Group led by Professor Dianna Bowles, has been reported. These proteins specifically bind to ice crystals and stop them growing. The stress response team showed that extracts from **carrots** which had been growing under cold conditions could prevent ice crystal growth.

L27 ANSWER 33 OF 57 BIOSIS COPYRIGHT 2002 BIOLOGICAL ABSTRACTS INC.
SO Cryobiology, (1993) Vol. 30, No. 3, pp. 322-328. ISSN: 0011-2240.
AU Duman, John G. (1); Olsen, T. Mark
TI Thermal hysteresis protein activity in bacteria, fungi, and phylogenetically diverse plants.
AB Thermal hysteresis **antifreeze proteins** have been well studied in animals, especially marine teleost fishes and terrestrial arthropods, and recently thermal hysteresis proteins were reported in several plants, all angiosperms, collected in winter. This study shows for the first time that thermal hysteresis protein activity is also present in nonangiosperm plants, fungi, and bacteria. In addition to six species of angiosperms (Dicentra cucularia, Dutchman's breeches, tubers: Daucus carota, **carrot**, both cultivated and wild; Hemerocallis fulva, day-lily, bulbs; Populus deltoides, eastern cottonwood; Quercus alba, white oak, acorns; and Triticum aestivum, winter wheat), thermal hysteresis activity (THA) was demonstrated in the evergreen Christmas fern (Polystichum acrostichoides), a horsetail (Equisetum hymenale), a club moss (Lycopodium dendroideum), the ginko tree (Gynko biloba), and three mosses (Mnium cuspidatum, Polytrichum ohioense and Brachythecium salebrosum). Thus, THA is present in phylogenetically diverse plants. Thermal hysteresis protein activity was also identified for the first time in two additional kingdoms, the fungi and bacteria. Fungi included fruiting bodies of the winter mushroom (Flammulina velupites) and the oyster mushroom (Pleurotus ostreatus) and two bracket fungi (Coriolus versicolor and a Stereum sp.). In addition, two bacteria (Rhodococcus erythropolis and Micrococcus cryophilus) acclimated at 3 degree C had THA. In plants and fungi THA was only present during winter and in bacteria when cold acclimated. Treatment of samples of certain of these organisms with protease eliminated the THA, demonstrating that the activity was due to the presence of thermal hysteresis proteins.

L27 ANSWER 34 OF 57 USPATFULL
IN Warren, Gareth J., San Francisco, CA, United States
Mueller, Gunhild M., San Francisco, CA, United States
McKown, Robert L., Albany, CA, United States
TI Ice crystal growth suppression polypeptides and method of making
AB Novel methods of improving freezing tolerance of organic materials through the use of **antifreeze polypeptides** is provided. These polypeptides increase the storage life of foodstuffs and biologics, as well as protect plant products, such as during growth. The **antifreeze polypeptides**, or their fusion proteins, may

be produced chemically or by recombinant DNA techniques, and then purified for a variety of uses.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L27 ANSWER 35 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Doucet C J; Fenn R A; McArthur A J; Sidebottom C M; Smallwood M F; Warrell D
TI Frozen food product mfg. process - using anti-freeze peptides to produce specific elongated ice crystals with desirable ice recrystallisation properties and relatively hard and brittle texture
AN ABB04380 peptide DGENE
AB The invention relates to a process for the production of a frozen food product comprising anti-freeze peptides (AFP), where the conditions are chosen so that the ice crystals in the product have an aspect ratio of 1.9 or greater. The process is used for preparing frozen confectionery products and ice-cream mixes. The present sequence is part of a peptide with antifreeze properties isolated from **carrot** (Daucus carota, cultivar Autumn King).

L27 ANSWER 36 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Doucet C J; Fenn R A; McArthur A J; Sidebottom C M; Smallwood M F; Warrell D
TI Frozen food product mfg. process - using anti-freeze peptides to produce specific elongated ice crystals with desirable ice recrystallisation properties and relatively hard and brittle texture
AN ABB04378 peptide DGENE
AB The invention relates to a process for the production of a frozen food product comprising anti-freeze peptides (AFP), where the conditions are chosen so that the ice crystals in the product have an aspect ratio of 1.9 or greater. The process is used for preparing frozen confectionery products and ice-cream mixes. The present sequence is that of a peptide with antifreeze properties isolated from **carrot** (Daucus carota, cultivar Autumn King).

L27 ANSWER 37 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Doucet C J; Fenn R A; McArthur A J; Sidebottom C M; Smallwood M F; Warrell D
TI Frozen food product mfg. process - using anti-freeze peptides to produce specific elongated ice crystals with desirable ice recrystallisation properties and relatively hard and brittle texture
AN ABB04377 peptide DGENE
AB The invention relates to a process for the production of a frozen food product comprising anti-freeze peptides (AFP), where the conditions are chosen so that the ice crystals in the product have an aspect ratio of 1.9 or greater. The process is used for preparing frozen confectionery products and ice-cream mixes. The present sequence is that of a peptide with antifreeze properties isolated from **carrot** (Daucus carota, cultivar Autumn King).

L27 ANSWER 38 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Doucet C J; Fenn R A; McArthur A J; Sidebottom C M; Smallwood M F; Warrell D
TI Frozen food product mfg. process - using anti-freeze peptides to produce specific elongated ice crystals with desirable ice recrystallisation properties and relatively hard and brittle texture
AN ABB04376 peptide DGENE
AB The invention relates to a process for the production of a frozen food product comprising anti-freeze peptides (AFP), where the conditions are chosen so that the ice crystals in the product have an aspect ratio of 1.9 or greater. The process is used for preparing frozen confectionery products and ice-cream mixes. The present sequence is that of a peptide with antifreeze properties isolated from **carrot** (Daucus carota, cultivar Autumn King).

L27 ANSWER 39 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Doucet C J; Fenn R A; McArthur A J; Sidebottom C M; Smallwood M F; Warrell D
TI Frozen food product mfg. process - using anti-freeze peptides to produce specific elongated ice crystals with desirable ice recrystallisation properties and relatively hard and brittle texture
AN ABB04375 peptide DGENE
AB The invention relates to a process for the production of a frozen food product comprising anti-freeze peptides (AFP), where the conditions are chosen so that the ice crystals in the product have an aspect ratio of 1.9 or greater. The process is used for preparing frozen confectionery products and ice-cream mixes. The present sequence is that of a peptide with antifreeze properties isolated from **carrot** (Daucus carota, cultivar Autumn King).

L27 ANSWER 40 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Doucet C J; Fenn R A; McArthur A J; Sidebottom C M; Smallwood M F; Warrell D
TI Frozen food product mfg. process - using anti-freeze peptides to produce specific elongated ice crystals with desirable ice recrystallisation properties and relatively hard and brittle texture
AN ABB04374 peptide DGENE
AB The invention relates to a process for the production of a frozen food product comprising anti-freeze peptides (AFP), where the conditions are chosen so that the ice crystals in the product have an aspect ratio of 1.9 or greater. The process is used for preparing frozen confectionery products and ice-cream mixes. The present sequence is that of a peptide with antifreeze properties isolated from **carrot** (Daucus carota, cultivar Autumn King).

L27 ANSWER 41 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Darling D F; Doucet C J; Fenn R A; Lillford P J; McArthur A J; Needham D; Sidebottom C M; Smallwood K; Smallwood M F; Warrell D
TI Frozen confectionery products e.g. ice cream - contain at one **antifreeze protein** derived from plants e.g. Juncus squarrosus or Geranium
AN AAW61653 peptide DGENE
AB The **antifreeze proteins** (AFP) were derived from plants where the AFPs in an aqueous composition have an ice crystal size of less than 15 micro m after quick freezing to -40 deg. C or less, followed by storage for one hour at -6 deg. C. The AFPs improve the freezing tolerance of frozen products by inhibiting the recrystallisation of ice, and controlling ice crystal shape. They also improve the textural properties of frozen products like ice cream.

L27 ANSWER 42 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Darling D F; Doucet C J; Fenn R A; Lillford P J; McArthur A J; Needham D; Sidebottom C M; Smallwood K; Smallwood M F; Warrell D
TI Frozen confectionery products e.g. ice cream - contain at one **antifreeze protein** derived from plants e.g. Juncus squarrosus or Geranium
AN AAW61657 peptide DGENE
AB The **antifreeze proteins** (AFP) were derived from plants where the AFPs in an aqueous composition have an ice crystal size of less than 15 micro m after quick freezing to -40 deg. C or less, followed by storage for one hour at -6 deg. C. The AFPs improve the freezing tolerance of frozen products by inhibiting the recrystallisation of ice, and controlling ice crystal shape. They also improve the textural properties of frozen products like ice cream.

L27 ANSWER 43 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Darling D F; Doucet C J; Fenn R A; Lillford P J; McArthur A J; Needham D; Sidebottom C M; Smallwood K; Smallwood M F; Warrell D
TI Frozen confectionery products e.g. ice cream - contain at one **antifreeze protein** derived from plants e.g. Juncus

squarrosus or Geranium
AN AAW61656 peptide DGENE
AB The **antifreeze proteins** (AFP) were derived from plants where the AFPs in an aqueous composition have an ice crystal size of less than 15 micro m after quick freezing to -40 deg. C or less, followed by storage for one hour at -6 deg. C. The AFPs improve the freezing tolerance of frozen products by inhibiting the recrystallisation of ice, and controlling ice crystal shape. They also improve the textural properties of frozen products like ice cream.

L27 ANSWER 44 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Darling D F; Doucet C J; Fenn R A; Lillford P J; McArthur A J; Needham D; Sidebottom C M; Smallwood K; Smallwood M F; Warrell D
TI Frozen confectionery products e.g. ice cream - contain at one **antifreeze protein** derived from plants e.g. Juncus squarrosus or Geranium
AN AAW61655 peptide DGENE
AB The **antifreeze proteins** (AFP) were derived from plants where the AFPs in an aqueous composition have an ice crystal size of less than 15 micro m after quick freezing to -40 deg. C or less, followed by storage for one hour at -6 deg. C. The AFPs improve the freezing tolerance of frozen products by inhibiting the recrystallisation of ice, and controlling ice crystal shape. They also improve the textural properties of frozen products like ice cream.

L27 ANSWER 45 OF 57 DGENE (C) 2002 THOMSON DERWENT
IN Byass L J; Darling D F; Doucet C J; Fenn R A; Lillford P J; McArthur A J; Needham D; Sidebottom C M; Smallwood K; Smallwood M F; Warrell D
TI Frozen confectionery products e.g. ice cream - contain at one **antifreeze protein** derived from plants e.g. Juncus squarrosus or Geranium
AN AAW61654 peptide DGENE
AB The **antifreeze proteins** (AFP) were derived from plants where the AFPs in an aqueous composition have an ice crystal size of less than 15 micro m after quick freezing to -40 deg. C or less, followed by storage for one hour at -6 deg. C. The AFPs improve the freezing tolerance of frozen products by inhibiting the recrystallisation of ice, and controlling ice crystal shape. They also improve the textural properties of frozen products like ice cream.

L27 ANSWER 46 OF 57 GENBANK.RTM. COPYRIGHT 2002

JOURNAL (SO): Patent: WO 9822591-A 11 28-MAY-1998; BYASS LOUISE JANE (GB); DOUCET CHARLOTTE JULIETTE (GB)
AUTHOR (AU): Byass,L.J.; Doucet,C.J.
TITLE (TI): **CARROT ANTIFREEZE POLYPEPTIDES**

L27 ANSWER 47 OF 57 GENBANK.RTM. COPYRIGHT 2002

JOURNAL (SO): Patent: WO 9822591-A 10 28-MAY-1998; BYASS LOUISE JANE (GB); DOUCET CHARLOTTE JULIETTE (GB)
AUTHOR (AU): Byass,L.J.; Doucet,C.J.
TITLE (TI): **CARROT ANTIFREEZE POLYPEPTIDES**

L27 ANSWER 48 OF 57 GENBANK.RTM. COPYRIGHT 2002

JOURNAL (SO): Patent: WO 9822591-A 9 28-MAY-1998; BYASS LOUISE JANE (GB); DOUCET CHARLOTTE JULIETTE (GB)
AUTHOR (AU): Byass,L.J.; Doucet,C.J.
TITLE (TI): **CARROT ANTIFREEZE POLYPEPTIDES**

L27 ANSWER 49 OF 57 GENBANK.RTM. COPYRIGHT 2002

JOURNAL (SO): Patent: WO 9822591-A 6 28-MAY-1998; BYASS LOUISE JANE (GB); DOUCET CHARLOTTE JULIETTE (GB)
AUTHOR (AU): Byass,L.J.; Doucet,C.J.
TITLE (TI): **CARROT ANTIFREEZE POLYPEPTIDES**

L27 ANSWER 50 OF 57 GENBANK.RTM. COPYRIGHT 2002

JOURNAL (SO): FEBS Lett., 447 (2-3), 171-178 (1999)
JOURNAL (SO): Submitted (05-DEC-1998) Meyer K., Forestry Research Unit, Shell International Renewables, HRI East Malling, KEnT ME19 6 BJ, UK
AUTHOR (AU): Meyer,K.; Keil,M.; Naldrett,M.J.
AUTHOR (AU): Meyer,K.
TITLE (TI): A leucine-rich repeat protein of **carrot** that exhibits antifreeze activity
TITLE (TI): Direct Submission

L27 ANSWER 51 OF 57 GENBANK.RTM. COPYRIGHT 2002

JOURNAL (SO): Science, 282 (5386), 115-117 (1998)
JOURNAL (SO): Submitted (23-MAR-1998) Biology, University of York, University Road, PO Box 373, York YO1 5YW, UK
AUTHOR (AU): Worrall,D.; Elias,L.; Ashford,D.; Smallwood,M.; Sidebottom,C.; Lillford,P.; Telford,J.; Holt,C.; Bowles,D.
AUTHOR (AU): Worrall,D.
TITLE (TI): A **carrot** leucine-rich-repeat protein that inhibits ice recrystallization
TITLE (TI): Direct Submission

L27 ANSWER 52 OF 57 BIOCOMMERCE COPYRIGHT 2002 BioCommerce Data Ltd.
SO Science, 02 OCT 1998, vol. 2825386, Page(s) 9,11,115-117.
Agricultural Supply Industry, 23 OCT 1998, vol. 2843, Page(s) 4.
AN 0175502 BIOCOMMERCE FS Abstract
AB Unilever and University of York collaborators have isolated a leucine rich **antifreeze protein** from **carrots** of potential use for increasing the frost tolerance of other crop plants. The protein may also be of use in frozen foods and to improve the efficiency of freezing tissue for medical uses.

L27 ANSWER 53 OF 57 FROSTI COPYRIGHT 2002 LFRA
SO PCT Patent Application
IN Smallwood K.
TI Frozen food product.
AN 479369 FROSTI
AB Anti-freeze peptides (AFP) improve freezing tolerance, but can have an adverse effect on texture and eating quality. It is disclosed that the mouthfeel and/or taste of frozen foods (such as bakery products and ice cream) can be improved by adding AFP and storing at higher temperatures of -2 to -12 C. Ice cream made with **carrot** AFP, for example, becomes creamier and smoother, with improved aroma and flavour release. (See also WO 98/41106 and WO 98/41109.)

L27 ANSWER 54 OF 57 FROSTI COPYRIGHT 2002 LFRA
SO PCT Patent Application
IN Byass L.J.; Doucet C.J.; Fenn R.A.; McArthur A.J.; Debottom C.M.; Smallwood M.F.; Warrell D.
TI **Carrot antifreeze polypeptides**.
AN 475994 FROSTI
AB Anti-freeze proteins inhibit the growth of ice crystals, and can be used to improve the quality of frozen foods, such as ice cream and other frozen confectionery products. The present invention provides novel **antifreeze polypeptides**, which are easily obtained from

an abundant natural source, i.e. **carrots**. The **antifreeze polypeptides** of the invention provide good recrystallization inhibition properties without significantly changing the crystal shape of the ice crystals. The polypeptides can easily be obtained from **carrots**, but can also be obtained by genetic transformation from a number of other plants, such as maize, tomato, tobacco, strawberries, rapeseed and sugar beet.

L27 ANSWER 55 OF 57 FROSTI COPYRIGHT 2002 LFRA
SO PCT Patent Application
IN Byass L.J.; Darling D.F.; Doucet C.J.; Fenn R.A.; Lillford P.J.; McArthur A.J.; Needham D.; Sidebottom C.; Smallwood K.; Smallwood M.F.
TI Frozen confectionery products.
AN 464123 FROSTI
AB The use of **antifreeze proteins** (AFPs) from plant sources is disclosed for manufacture of frozen confectionery. These proteins limit the growth of ice crystals in the frozen product, improving the freezing tolerance of products. The AFPs are suitable for use if the ice-crystal size is less than 15 microns after quick freezing of the product to -40 C followed by storage for 1 hour at -6 C. This process provides a test for selection of AFPs that may be used for a specific application. Use of plant AFPs will be more acceptable to consumers who require natural vegetable sources for additives than fish AFPs. A wide range of plant sources is listed, including **carrots** , grasses, bamboo, and lichens. Food applications include ice cream, water ices, and frozen fruit purees. Formulations are given for liquid pre-mixes for ice-cream preparation.

L27 ANSWER 56 OF 57 FROSTI COPYRIGHT 2002 LFRA
SO British Patent Application
IN Byass L.J.; Darling D.F.; Doucet C.J.; Fenn R.A.; Lillford P.J.; McArthur A.J.; Needham D.; Sidebottom C.M.; Smallwood K.; Smallwood M.F.
TI Plant **antifreeze proteins** for use in frozen confectionary.
AN 466030 FROSTI
AB A test is disclosed for selecting plant **antifreeze proteins** (AFPs) that are particularly suitable for use in ice cream and other frozen confectionery. An aqueous composition containing the candidate AFP is quick frozen to -40 C or less and stored for 1 hour at -6 C. Suitable AFPs produce an ice-crystal size of less than 15 micrometres. Some preferred AFPs are listed, which can be extracted from cold-acclimatized **carrots**, grasses, bamboo, winter rye, lichens, etc. (See also GB 2 315 661, GB 2 315 662 and GB 2 315 752.)

L27 ANSWER 57 OF 57 FROSTI COPYRIGHT 2002 LFRA
SO European Patent Application
IN Byass L.J.; Darling D.F.; Doucet C.J.; Fenn R.A.; Lillford P.J.; McArthur A.J.; Needham D.; Sidebottom C.; Smallwood K.; Smallwood M.F.
TI Frozen confectionery products.
AN 517887 FROSTI
AB The use of **antifreeze proteins** (AFPs) from plant sources is disclosed for manufacture of frozen confectionery. These proteins limit the growth of ice crystals in the frozen product, improving the freezing tolerance of products. The AFPs are suitable for use if the ice-crystal size is less than 15 microns after quick freezing of the product to -40 C followed by storage for 1 hour at -6 C. This process provides a test for selection of AFPs that may be used for a specific application. Use of plant AFPs will be more acceptable to consumers who require natural vegetable sources for additives than fish AFPs. A wide range of plant sources is listed, including **carrots** , grasses, bamboo, and lichens. Food applications include ice cream, water ices, and frozen fruit purees. Formulations are given for liquid pre-mixes for ice-cream preparation.

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☐ 1. Document ID: US 20020173024 A1

L3: Entry 1 of 27 File: PGPB Nov 21, 2002

PGPUB-DOCUMENT-NUMBER: 20020173024
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020173024 A1

TITLE: Nucleic acid sequences encoding type III tenebrio antifreeze proteins and method for assaying activity

PUBLICATION-DATE: November 21, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Horwath, Kathleen L.	Endwell	NY	US	
Easton, Christopher M.	Ithaca	NY	US	

US-CL-CURRENT: 435/199; 435/252.3, 435/320.1, 435/6, 435/69.1, 536/23.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 2. Document ID: US 20020172951 A1

L3: Entry 2 of 27 File: PGPB Nov 21, 2002

PGPUB-DOCUMENT-NUMBER: 20020172951
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020172951 A1

TITLE: Nucleic acid sequences encoding type III tenebrio antifreeze proteins and method for assaying activity

PUBLICATION-DATE: November 21, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Horwath, Kathleen L.	Endwell	NY	US	
Meyers, Kevin L.	Trumansburg	NY	US	

US-CL-CURRENT: 435/6

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 3. Document ID: US 20010048962 A1

L3: Entry 3 of 27 File: PGPB Dec 6, 2001

PGPUB-DOCUMENT-NUMBER: 20010048962
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20010048962 A1

TITLE: FROZEN FOOD PRODUCT

PUBLICATION-DATE: December 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
ANTHONY FENN, RICHARD	COLWORTH		GB	
NEEDHAM, DAVID	COLWORTH		GB	
SMALLWOOD, KEITH	COLWORTH		GB	

US-CL-CURRENT: 426/565; 426/100, 426/101, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw. Desc | Image

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☐ 4. Document ID: US 6491960 B1

L3: Entry 4 of 27 File: USPT Dec 10, 2002

US-PAT-NO: 6491960
DOCUMENT-IDENTIFIER: US 6491960 B1

TITLE: Ice confection

DATE-ISSUED: December 10, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Daniel; Adrian	Bedford			GB
Fenn; Richard Anthony	Gloucestershire			GB
Oldroyd; Jon Richard	Bedford			GB

US-CL-CURRENT: 426/565; 426/101, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw. Desc | Image

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☐ 5. Document ID: US 6447829 B1

L3: Entry 5 of 27 File: USPT Sep 10, 2002

US-PAT-NO: 6447829
DOCUMENT-IDENTIFIER: US 6447829 B1

TITLE: Ice confection

DATE-ISSUED: September 10, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Daniel; Adrian	Bedford			GB
Oldroyd; Jon Richard	Bedford			GB

US-CL-CURRENT: 426/565; 426/101, 426/524, 426/656

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 6. Document ID: US 6436460 B1

L3: Entry 6 of 27 File: USPT Aug 20, 2002

US-PAT-NO: 6436460
DOCUMENT-IDENTIFIER: US 6436460 B1

TITLE: Ice confection

DATE-ISSUED: August 20, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Daniel; Adrian	Bedford			GB
Lacy; Ian	Bedford			GB
Oldroyd; Jon Richard	Bedford			GB

US-CL-CURRENT: 426/565; 426/101, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 7. Document ID: US 6312733 B1

L3: Entry 7 of 27 File: USPT Nov 6, 2001

US-PAT-NO: 6312733
DOCUMENT-IDENTIFIER: US 6312733 B1

TITLE: Ice crystal growth inhibiting agents from Zoarces viviparus

DATE-ISSUED: November 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Jann; Alfred	Publier			FR
Lundheim; Rolv	Trondheim			NO

US-CL-CURRENT: 424/531; 426/657, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 8. Document ID: US 6303388 B1

L3: Entry 8 of 27 File: USPT Oct 16, 2001

US-PAT-NO: 6303388
DOCUMENT-IDENTIFIER: US 6303388 B1

TITLE: Process for preparing novel ice-controlling molecules

DATE-ISSUED: October 16, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fahy; Gregory M.	Gaithersburg	MD		

US-CL-CURRENT: 436/518; 252/70, 424/184.1, 435/7.1, 435/7.8

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 9. Document ID: US 6210742 B1

L3: Entry 9 of 27 File: USPT Apr 3, 2001

US-PAT-NO: 6210742
DOCUMENT-IDENTIFIER: US 6210742 B1

TITLE: Uses of oil bodies

DATE-ISSUED: April 3, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Deckers; Harm M	Calgary			CA
van Rooijen; Gijs	Calgary			CA
Boothe; Joseph	Calgary			CA
Goll; Janis	Calgary			CA
Mahmoud; Soheil	Calgary			CA
Moloney; Maurice M.	Calgary			CA

US-CL-CURRENT: 426/630; 426/302, 426/602, 426/615, 426/635, 426/89, 516/53

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 10. Document ID: US 6200622 B1

L3: Entry 10 of 27 File: USPT Mar 13, 2001

US-PAT-NO: 6200622
DOCUMENT-IDENTIFIER: US 6200622 B1

TITLE: Frozen food product

DATE-ISSUED: March 13, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Darling; Donald Frank	Colworth			GB
Hoddle; Andrew	Colworth			GB

US-CL-CURRENT: 426/565; 426/101, 426/524, 426/656, 426/660, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 11. Document ID: US 6183762 B1

L3: Entry 11 of 27 File: USPT Feb 6, 2001

US-PAT-NO: 6183762
DOCUMENT-IDENTIFIER: US 6183762 B1

TITLE: Oil body based personal care products

DATE-ISSUED: February 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Deckers; Harm M.	Calgary			CA
van Rooijen; Gijs	Calgary			CA
Boothe; Joseph	Calgary			CA
Goll; Janis	Calgary			CA
Moloney; Maurice M.	Calgary			CA

US-CL-CURRENT: 424/401; 426/417, 426/601, 426/602, 426/605, 426/615, 426/629, 426/635, 426/805, 514/937, 516/53

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw. Desc | Image

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☐ 12. Document ID: US 6174550 B1

L3: Entry 12 of 27 File: USPT Jan 16, 2001

US-PAT-NO: 6174550
DOCUMENT-IDENTIFIER: US 6174550 B1

TITLE: Antifreeze polypeptide-expressing microorganisms useful in fermentation and frozen storage of foods

DATE-ISSUED: January 16, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fletcher; Garth L.	St. John's			CA
Hew; Choy L.	Thornhill			CA
Joshi; Shashikant B.	Toronto			CA
Wu; Yaling	St. John's			CA

US-CL-CURRENT: 426/34; 426/36, 426/42, 426/580, 426/583, 435/252.9, 435/253.4, 435/41, 435/71.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw. Desc | Image

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☐ 13. Document ID: US 6162789 A

L3: Entry 13 of 27 File: USPT Dec 19, 2000

US-PAT-NO: 6162789
DOCUMENT-IDENTIFIER: US 6162789 A

TITLE: Frozen food product

DATE-ISSUED: December 19, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Sidebottom; Christopher Michael	Colworth			GB
Wilding; Peter	Colworth			GB

US-CL-CURRENT: 514/13; 426/249, 514/15, 530/326, 530/328, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

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☐ 14. Document ID: US 6156880 A

L3: Entry 14 of 27 File: USPT Dec 5, 2000

US-PAT-NO: 6156880
DOCUMENT-IDENTIFIER: US 6156880 A

TITLE: Frozen food product

DATE-ISSUED: December 5, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Sidebottom; Christopher Michael	Colworth			GB
Wilding; Peter	Colworth			GB

US-CL-CURRENT: 530/350; 426/524, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

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☐ 15. Document ID: US 6146645 A

L3: Entry 15 of 27 File: USPT Nov 14, 2000

US-PAT-NO: 6146645
DOCUMENT-IDENTIFIER: US 6146645 A

TITLE: Uses of oil bodies

DATE-ISSUED: November 14, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Deckers; Harm M	Calgary			CA
van Rooijen; Gijs	Calgary			CA
Boothe; Joseph	Calgary			CA
Goll; Janis	Calgary			CA
Mahmoud; Soheil	Calgary			CA
Moloney; Maurice M.	Calgary			CA

US-CL-CURRENT: 424/401; 426/417, 426/601, 426/602, 426/605, 426/615, 426/629, 426/635, 426/805, 514/937, 516/53

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

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☐ 16. Document ID: US 6096867 A

L3: Entry 16 of 27 File: USPT Aug 1, 2000

US-PAT-NO: 6096867
DOCUMENT-IDENTIFIER: US 6096867 A

TITLE: Frozen food product

DATE-ISSUED: August 1, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Byass; Louise Jane	Heslington			GB
Darling; Donald Frank	Colworth			GB
Doucet; Charlotte Juliette	Heslington			GB
Fenn; Richard Anthony	Colworth			GB
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Needham; David	Colworth			GB
Sidebottom; Christopher	Colworth			GB
Smallwood; Keith	Colworth			GB
Smallwood; Margaret Felicia	Heslington			GB

US-CL-CURRENT: 530/350; 426/100, 426/101, 426/139, 426/49, 426/656, 426/660, 530/300, 530/326, 530/328

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw Desc | Image

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☐ 17. Document ID: US 6090917 A

L3: Entry 17 of 27 File: USPT Jul 18, 2000

US-PAT-NO: 6090917
DOCUMENT-IDENTIFIER: US 6090917 A

TITLE: Frozen food product

DATE-ISSUED: July 18, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Sidebottom; Christopher Michael	Colworth			GB

US-CL-CURRENT: 530/350; 426/100, 426/101, 426/104, 426/139, 426/565, 530/300, 530/326, 530/327, 530/328

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 18. Document ID: US 5972679 A

L3: Entry 18 of 27 File: USPT Oct 26, 1999

US-PAT-NO: 5972679
DOCUMENT-IDENTIFIER: US 5972679 A

TITLE: Cold tolerances in plants

DATE-ISSUED: October 26, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Griffith; Marilyn	Waterloo			CA

US-CL-CURRENT: 435/204; 435/205, 435/209, 530/350, 530/370, 530/372, 530/379

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 19. Document ID: US 5928877 A

L3: Entry 19 of 27 File: USPT Jul 27, 1999

US-PAT-NO: 5928877
DOCUMENT-IDENTIFIER: US 5928877 A

TITLE: Assay for an antifreeze protein

DATE-ISSUED: July 27, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lusk; Lance	Milwaukee	WI		
Cronan; Charles L.	Shorewood	WI		

US-CL-CURRENT: 435/7.1; 435/14, 435/7.4

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 20. Document ID: US 5852172 A

L3: Entry 20 of 27 File: USPT Dec 22, 1998

US-PAT-NO: 5852172

DOCUMENT-IDENTIFIER: US 5852172 A

TITLE: Cold tolerances in plants

DATE-ISSUED: December 22, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Griffith; Marilyn	Waterloo			CA

US-CL-CURRENT: 530/379; 435/204, 435/205, 435/209, 530/360, 530/370, 530/372

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 21. Document ID: US 5849537 A

L3: Entry 21 of 27 File: USPT Dec 15, 1998

US-PAT-NO: 5849537
DOCUMENT-IDENTIFIER: US 5849537 A

TITLE: Method of expressing antifreeze proteins in yeast

DATE-ISSUED: December 15, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tripp; Matthew	Nashotah	WI		
Lusk; Lance	Milwaukee	WI		
Rhodes; Thomas	Cedarburg	WI		
Huige; Nick	Brookfield	WI		
Kot; Edward	Delafield	WI		
Chicoye; Etzer	Wauwatosa	WI		
Barney; Michael C.	Wauwatosa	WI		
Bower; Patricia A.	Milwaukee	WI		
Cronan; Charles L.	Shorewood	WI		

US-CL-CURRENT: 435/69.7; 435/254.21, 435/320.1, 536/23.4, 536/23.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 22. Document ID: US 5676985 A

L3: Entry 22 of 27 File: USPT Oct 14, 1997

US-PAT-NO: 5676985
DOCUMENT-IDENTIFIER: US 5676985 A

TITLE: Antifreeze polypeptide-expressing microorganisms useful in fermentation and freezing of foods

DATE-ISSUED: October 14, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fletcher; Garth L.	St. John's			CA
Hew; Choy L.	Thornhill			CA
Joshi; Shashikant B.	Toronto			CA
Wu; Yaling	St. John's			CA

US-CL-CURRENT: 426/36; 426/34, 426/42, 435/252.9, 435/253.4, 435/41, 435/71.1, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 23. Document ID: WO 9702343 A1

L3: Entry 23 of 27 File: EPAB Jan 23, 1997

PUB-NO: WO009702343A1
DOCUMENT-IDENTIFIER: WO 9702343 A1
TITLE: EXPRESSION OF OCEAN FISH ANTIFREEZE PEPTIDE IN A FOOD GRADE ORGANISM AND ITS APPLICATION IN FOOD PRODUCTS

PUBN-DATE: January 23, 1997

INVENTOR-INFORMATION:

NAME	COUNTRY
CHAPMAN, JOHN WILLIAM	
MUSTERS, WOUTER	
VAN, WASSENAAR PIETER DIRK	

INT-CL (IPC): C12 N 15/12; A23 L 3/36; C07 K 14/46; C12 N 1/21
EUR-CL (EPC): C07K014/46

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 24. Document ID: CN 1226138 A KR 2000029567 A WO 9804147 A1 EP 923306 A1 AU 720396 B AU 9736212 A BR 9710520 A CZ 9900250 A3 HU 9903274 A2 JP 2000515753 W MX 9900953 A1 SK 9900088 A3 IL 127489 A

L3: Entry 24 of 27 File: DWPI Aug 18, 1999

DERWENT-ACC-NO: 2001-203286
DERWENT-WEEK: 200162
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TITLE: Production of frozen confectionery and ice-cream - using antifreeze peptides to obtain rounded ice crystals with desirable properties

INVENTOR: NEEDHAM, D; SMALLWOOD, K ; FENN, R A

PRIORITY-DATA: 1996EP-0305499 (July 26, 1996), 1996EP-0305497 (July 26, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
CN 1226138 A	August 18, 1999		000	A23G009/02
KR 2000029567 A	May 25, 2000		000	A23G009/02
WO 9804147 A1	February 5, 1998	E	027	A23G009/02
EP 923306 A1	June 23, 1999	E	000	A23G009/02
AU 720396 B	June 1, 2000		000	A23G009/02
AU 9736212 A	February 20, 1998		000	A23G009/02
BR 9710520 A	August 17, 1999		000	A23G009/02
CZ 9900250 A3	July 14, 1999		000	A23G009/02
HU 9903274 A2	January 28, 2000		000	A23G009/02
JP 2000515753 W	November 28, 2000		024	A23G009/04
MX 9900953 A1	May 1, 1999		000	A23G009/02
SK 9900088 A3	June 11, 1999		000	A23G009/02
IL 127489 A	June 14, 2001		000	A23G009/02

INT-CL (IPC): A23 G 9/02; A23 G 9/04

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 25. Document ID: WO 9937164 A1 JP 2002500867 W AU 9924187 A BR 9814775 A EP 1049383 A1 SK 200001094 A3 CZ 200002694 A3 CN 1290127 A HU 200100521 A2 MX 2000007101 A1

L3: Entry 25 of 27 File: DWPI Jul 29, 1999

DERWENT-ACC-NO: 1999-444489
DERWENT-WEEK: 200207
COPYRIGHT 2002 DERWENT INFORMATION LTD
TITLE: A frozen food product comprising antifreeze peptides having an average ice crystal size of 0.01-20 microns

INVENTOR: CHENEY, P E; RUSSELL, A

PRIORITY-DATA: 1998GB-0001410 (January 22, 1998)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 9937164 A1	July 29, 1999	E	037	A23G009/02
JP 2002500867 W	January 15, 2002		033	A23G009/02
AU 9924187 A	August 9, 1999		000	A23G009/02
BR 9814775 A	October 24, 2000		000	A23G009/02
EP 1049383 A1	November 8, 2000	E	000	A23G009/02
SK 200001094 A3	January 18, 2001		000	A23G009/02
CZ 200002694 A3	April 11, 2001		000	A23G009/02
CN 1290127 A	April 4, 2001		000	A23G009/02
HU 200100521 A2	June 28, 2001		000	A23G009/02
MX 2000007101 A1	March 1, 2001		000	A23G009/02

INT-CL (IPC): A23 G 9/02; A23 G 9/04

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 26. Document ID: GB 2315752 A SK 282279 B6 FR 2751657 A1 WO 9804699 A1 DE 19732135 A1 AU 9734437 A DE 19732135 C2 EP 918863 A1 CZ 9900252 A3 SK 9900089 A3 CN 1226284 A BR 9710564 A HU 9903164 A2 US 6090917 A JP 2000515751 W US 6156880 A US 6162789 A AU 726699 B KR 2000029554 A MX 9900952 A1 GB 2315752 B ZA 9706477 A IT 1293767 B

L3: Entry 26 of 27 File: DWPI Feb 11, 1998

DERWENT-ACC-NO: 1998-089627
DERWENT-WEEK: 200213

TITLE: Anti-freeze proteins for use in frozen confectionery food products - have heat thermal stability shown by no significant reduction in ice-recrystallisation inhibition properties after specific heat treatments

INVENTOR: MCARTHUR, A J; SIDEBOTTOM, C M ; LILLFORD, P J ; WILDING, P ; SIDEBOTTOM, C

PRIORITY-DATA: 1996EP-0305497 (July 26, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
GB 2315752 A	February 11, 1998		033	C07K014/415
SK 282279 B6	January 7, 2002		000	C12N015/29
FR 2751657 A1	January 30, 1998		029	C07K007/04
WO 9804699 A1	February 5, 1998	E	033	C12N015/29
DE 19732135 A1	February 26, 1998		011	C07K004/10
AU 9734437 A	February 20, 1998		000	C12N015/29
DE 19732135 C2	July 23, 1998		000	C07K004/10
EP 918863 A1	June 2, 1999	E	000	C12N015/29
CZ 9900252 A3	July 14, 1999		000	C12N015/29
SK 9900089 A3	July 12, 1999		000	C12N015/29
CN 1226284 A	August 18, 1999		000	C12N015/29
BR 9710564 A	August 17, 1999		000	C12N015/29
HU 9903164 A2	January 28, 2000		000	C12N015/29
US 6090917 A	July 18, 2000		000	A61K038/00
JP 2000515751 W	November 28, 2000		029	C12N015/09
US 6156880 A	December 5, 2000		000	C12P021/02
US 6162789 A	December 19, 2000		000	A61K038/00
AU 726699 B	November 16, 2000		000	C12N015/29
KR 2000029554 A	May 25, 2000		000	C12N015/29
MX 9900952 A1	January 1, 2000		000	C12N015/29
GB 2315752 B	June 13, 2001		000	C07K014/415
ZA 9706477 A	March 31, 1999		033	C12N000/00
IT 1293767 B	March 10, 1999		000	A23G009/00

6156880 A , US 6162789 A INT-CL (IPC): A23C 3/00; A23G 1/22; A23G 3/00; A23G 9/00; A23G 9/02; A23G 9/04; A23J 1/00; A23L 3/36; A23L 3/37; A61K 38/00; A61K 38/02; C07K 1/14; C07K 4/10; C07K 5/00; C07K 7/00; C07K 7/04; C07K 13/00; C07K 14/415; C07K 15/00; C12N 0/00; C12N 15/09; C12N 15/29; C12N 15/63; C12N 15/82; C12P 21/02

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWMC | Draw Desc | Image

☐ 27. Document ID: GB 2315662 A DE 19732132 A1 FR 2751514 A1 ZA 9706472 A IT 1293769 B

L3: Entry 27 of 27 File: DWPI Feb 11, 1998

DERWENT-ACC-NO: 1998-089552
DERWENT-WEEK: 200208

TITLE: Production of frozen confectionery and ice-cream - using antifreeze peptides to obtain rounded ice crystals with desirable properties

INVENTOR: FENN, R A; NEEDHAM, D ; SMALLWOOD, K

PRIORITY-DATA: 1996EP-0305499 (July 26, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
GB 2315662 A	February 11, 1998		024	A23G009/02
DE 19732132 A1	January 29, 1998		000	A23G009/00
FR 2751514 A1	January 30, 1998		022	A23G009/02
ZA 9706472 A	March 31, 1999		024	A23G000/00
IT 1293769 B	March 10, 1999		000	A23G009/00

INT-CL (IPC): A23G 0/00; A23G 9/00; A23G 9/02; A23G 9/04; A23L 3/36

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments

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Term	Documents
ANTIFREEZE.DWPI,TDBD,EPAB,USPT,PGPB.	6092
ANTIFREEZES.DWPI,TDBD,EPAB,USPT,PGPB.	510
FOOD.DWPI,TDBD,EPAB,USPT,PGPB.	308761
FOODS.DWPI,TDBD,EPAB,USPT,PGPB.	73211
POLYPEPTIDE?	0
POLYPEPTIDEA.DWPI,TDBD,EPAB,USPT,PGPB.	1
POLYPEPTIDEB.DWPI,TDBD,EPAB,USPT,PGPB.	1
POLYPEPTIDED.DWPI,TDBD,EPAB,USPT,PGPB.	5
POLYPEPTIDEE.DWPI,TDBD,EPAB,USPT,PGPB.	1
POLYPEPTIDEL.DWPI,TDBD,EPAB,USPT,PGPB.	5
(ANTIFREEZE ADJ (POLYPEPTIDE? OR PEPTIDE? OR PROTEIN?) AND (FOOD ADJ PRODUCT?)).USPT,PGPB,EPAB,DWPI,TDBD.	27

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☐ 1. Document ID: US 20020165383 A1

L2: Entry 1 of 16 File: PGPB Nov 7, 2002

PGPUB-DOCUMENT-NUMBER: 20020165383
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020165383 A1

TITLE: Tenebrio antifreeze proteins

PUBLICATION-DATE: November 7, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Graham, Laurie A.	Kingston		CA	
Liou, Yih-Cherng	Kingston		CA	
Walker, Virginia K.	Sydenham		CA	
Davies, Peter L.	Kingston		CA	

US-CL-CURRENT: 536/23.5; 435/320.1, 435/325, 435/69.1, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

☐ 2. Document ID: US 20010048962 A1

L2: Entry 2 of 16 File: PGPB Dec 6, 2001

PGPUB-DOCUMENT-NUMBER: 20010048962
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20010048962 A1

TITLE: FROZEN FOOD PRODUCT

PUBLICATION-DATE: December 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
ANTHONY FENN, RICHARD	COLWORTH		GB	
NEEDHAM, DAVID	COLWORTH		GB	
SMALLWOOD, KEITH	COLWORTH		GB	

US-CL-CURRENT: 426/565; 426/100, 426/101, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw Desc | Image

☐ 3. Document ID: US 6491960 B1

L2: Entry 3 of 16 File: USPT Dec 10, 2002

US-PAT-NO: 6491960
DOCUMENT-IDENTIFIER: US 6491960 B1

TITLE: Ice confection

DATE-ISSUED: December 10, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Daniel; Adrian	Bedford			GB
Fenn; Richard Anthony	Gloucestershire			GB
Oldroyd; Jon Richard	Bedford			GB

US-CL-CURRENT: 426/565; 426/101, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 4. Document ID: US 6447829 B1

L2: Entry 4 of 16 File: USPT Sep 10, 2002

US-PAT-NO: 6447829
DOCUMENT-IDENTIFIER: US 6447829 B1

TITLE: Ice confection

DATE-ISSUED: September 10, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Daniel; Adrian	Bedford			GB
Oldroyd; Jon Richard	Bedford			GB

US-CL-CURRENT: 426/565; 426/101, 426/524, 426/656

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 5. Document ID: US 6436460 B1

L2: Entry 5 of 16 File: USPT Aug 20, 2002

US-PAT-NO: 6436460
DOCUMENT-IDENTIFIER: US 6436460 B1

TITLE: Ice confection

DATE-ISSUED: August 20, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Daniel; Adrian	Bedford			GB
Lacy; Ian	Bedford			GB
Oldroyd; Jon Richard	Bedford			GB

US-CL-CURRENT: 426/565; 426/101, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 6. Document ID: US 6392024 B1

L2: Entry 6 of 16 File: USPT May 21, 2002

US-PAT-NO: 6392024
DOCUMENT-IDENTIFIER: US 6392024 B1

TITLE: Tenebrio antifreeze proteins

DATE-ISSUED: May 21, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Graham; Laurie A.	Kingston			CA
Liou; Yih-Cherng	Kingston			CA
Walker; Virginia K.	Sydenham			CA
Davies; Peter L.	Kingston			CA

US-CL-CURRENT: 536/23.5; 435/252.3, 435/254.11, 435/254.21, 435/254.22, 435/320.1, 435/6, 536/23.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 7. Document ID: US 6348569 B1

L2: Entry 7 of 16 File: USPT Feb 19, 2002

US-PAT-NO: 6348569
DOCUMENT-IDENTIFIER: US 6348569 B1

TITLE: Spruce budworm antifreeze proteins, genes and method of using same

DATE-ISSUED: February 19, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Walker; Virginia K.	Sydenham			CA
Davies; Peter L.	Kingston			CA
Rahavard; Mitra	Kingston			CA
Tyshenko; Michael G.	Kingston			CA

US-CL-CURRENT: 530/300; 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 8. Document ID: US 6200622 B1

L2: Entry 8 of 16 File: USPT Mar 13, 2001

US-PAT-NO: 6200622
DOCUMENT-IDENTIFIER: US 6200622 B1

TITLE: Frozen food product

DATE-ISSUED: March 13, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Darling; Donald Frank	Colworth			GB
Hoddle; Andrew	Colworth			GB

US-CL-CURRENT: 426/565; 426/101, 426/524, 426/656, 426/660, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 9. Document ID: US 6162789 A

L2: Entry 9 of 16 File: USPT Dec 19, 2000

US-PAT-NO: 6162789
DOCUMENT-IDENTIFIER: US 6162789 A

TITLE: Frozen food product

DATE-ISSUED: December 19, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Sidebottom; Christopher Michael	Colworth			GB
Wilding; Peter	Colworth			GB

US-CL-CURRENT: 514/13; 426/249, 514/15, 530/326, 530/328, 530/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | KWIC | Draw. Desc | Image

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☐ 10. Document ID: US 6156880 A

L2: Entry 10 of 16 File: USPT Dec 5, 2000

US-PAT-NO: 6156880
DOCUMENT-IDENTIFIER: US 6156880 A

TITLE: Frozen food product

DATE-ISSUED: December 5, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Sidebottom; Christopher Michael	Colworth			GB
Wilding; Peter	Colworth			GB

US-CL-CURRENT: 530/350; 426/524, 426/656, 426/660

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 11. Document ID: US 6096867 A

L2: Entry 11 of 16 File: USPT Aug 1, 2000

US-PAT-NO: 6096867
DOCUMENT-IDENTIFIER: US 6096867 A

TITLE: Frozen food product

DATE-ISSUED: August 1, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Byass; Louise Jane	Heslington			GB
Darling; Donald Frank	Colworth			GB
Doucet; Charlotte Juliette	Heslington			GB
Fenn; Richard Anthony	Colworth			GB
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Needham; David	Colworth			GB
Sidebottom; Christopher	Colworth			GB
Smallwood; Keith	Colworth			GB
Smallwood; Margaret Felicia	Heslington			GB

US-CL-CURRENT: 530/350; 426/100, 426/101, 426/139, 426/49, 426/656, 426/660, 530/300, 530/326, 530/328

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

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☐ 12. Document ID: US 6090917 A

L2: Entry 12 of 16 File: USPT Jul 18, 2000

US-PAT-NO: 6090917
DOCUMENT-IDENTIFIER: US 6090917 A

TITLE: Frozen food product

DATE-ISSUED: July 18, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lillford; Peter John	Colworth			GB
McArthur; Andrew John	Colworth			GB
Sidebottom; Christopher Michael	Colworth			GB

US-CL-CURRENT: 530/350; 426/100, 426/101, 426/104, 426/139, 426/565, 530/300, 530/326, 530/327, 530/328

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 13. Document ID: US 6008016 A

L2: Entry 13 of 16 File: USPT Dec 28, 1999

US-PAT-NO: 6008016
DOCUMENT-IDENTIFIER: US 6008016 A

TITLE: Spruce budworm antifreeze proteins, genes and methods of using same

DATE-ISSUED: December 28, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Walker; Virginia K.	Sydenham			CA
Davies; Peter L.	Kingston			CA
Rahavard; Mitra	Kingston			CA
Tyshenko; Michael G.	Kingston			CA

US-CL-CURRENT: 435/69.1; 435/252.3, 435/252.33, 435/254.11, 435/254.2, 435/254.21, 435/320.1, 435/325, 435/410, 530/300 , 530/350, 536/23.5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 14. Document ID: US 5118792 A

L2: Entry 14 of 16 File: USPT Jun 2, 1992

US-PAT-NO: 5118792
DOCUMENT-IDENTIFIER: US 5118792 A

TITLE: Ice crystal growth suppression polypeptides and method of making

DATE-ISSUED: June 2, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Warren; Gareth J.	San Francisco	CA		
Mueller; Gunhild M.	San Francisco	CA		
McKown; Robert L.	Albany	CA		

US-CL-CURRENT: 530/350; 426/321, 426/656, 426/657, 435/69.1, 435/69.7

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments KWIC | Draw Desc | Image

☐ 15. Document ID: EP 843010 A1

L2: Entry 15 of 16 File: EPAB May 20, 1998

PUB-NO: EP000843010A1
DOCUMENT-IDENTIFIER: EP 843010 A1
TITLE: Carrot anti-freeze polypeptides